

THE TEN-YEAR PROGNOSIS OF ATHEROSCLEROSIS OF THE LOWER LIMB

by

H. C. DALES, M.D., M.Ch., F.R.C.S.

Musgrave Park, Hospital, Belfast

ATHEROSCLEROSIS is the main cause of obliterative arterial disease and other causes, such as thrombo-angitis obliterans, collagen disease and cystic medial necrosis, are rare. The only exception is embolic occlusion, which is an important and common cause in the presence of acute heart disease (Gillespie, J. A. 1970). All the cases used in this survey had either endarterectomy or a reversed saphenous vein by-pass carried out on them, and the pathology was confirmed by histological examination. Of the 68 cases, 4 were lost and the remaining 64 followed up for a minimum of ten years after operation. There were 52 males and 12 females. The commonest decade was 51–60 years of age. The sex ratio and age grouping is similar to the findings of other authors, for example, Cockett and Maurice (1963), and Watt *et al* (1974).

Two out of the 52 males did not smoke tobacco, and 4 of the 12 females did not smoke tobacco. Juergens *et al* (1960) showed that in men with obliterative arterial disease just over 1 per cent do not smoke tobacco, compared with 25–30 per cent of the normal population. Eastcott (1969) quotes 2,000 patients of lower limb ischaemia with less than 12 male non-smokers. In 1958 the United Kingdom survey showed that 24 per cent of males were non-smokers. Thus, the tobacco smoking habits of the male patients under survey are similar to those reported by other authors. The blood groups were normal for the population. Weight was investigated, and was not significant. Blood cholesterol, blood urea and peripheral blood counts did not reveal any aetiological factor. Approximately 5 per cent of the patients in the survey had a raised fasting blood sugar, but this is small compared to other series, such as Wahlderg (1962), who described the glucose tolerance test as abnormal in nearly half of his patients with atherosclerosis, and Skovborg (1966), who described 20 per cent of a series of 520 patients who, while attending his male clinic for peripheral atherosclerosis, were found to have diabetes.

All cases had obliteration of either the superficial femoral or the superficial femoral and upper third of the popliteal artery. A few of the earlier cases had a direct endarterectomy with simple suture of the incision in the arterial wall, but many had gusset saphenous vein grafting. In this, after endarterectomy, the long saphenous vein is used as a gusset and inserted into the endarterectomised vessel in such a way that there is no narrowing of the artery, and at the end of the operation there is an artery with normal lumen, two-thirds of the wall being the original artery and one-third being the long saphenous vein. Some of the cases were treated by reversed saphenous vein by-pass.

TABLE I
Success Rate of the Arterial Reconstruction

	<i>Total</i>	<i>Failure Immediate</i>	<i>Excellent Immediate</i>	<i>Excellent 5 year</i>	<i>Excellent 10 year</i>
30-40	4	2	2	2 (50%)	2 (50%)
41-50	12	2	10	8 (66%)	5 (42%)
51-60	32	2	30	19 (59%)	11 (34%)
61-70	12	1	11	8 (66%)	3 (25%)
71-	4	1	3	0	0
	64	8	56 (87%)	37 (58%)	21 (33%)

The success rate of the arterial reconstruction is shown in Table I. A case was considered as having an excellent result if one or other pedal pulses was present after operation. The immediate follow-up showed an 87 per cent excellent result rate, and this compares very favourably with other authors, such as Eadie (1970), who had a success rate of 72 per cent, and Darling (1964), whose success rate was 75 per cent. Unfortunately, the 5-year follow-up shows only 58 per cent of cases remained excellent. The success rate does not alter much with age until 70 years of age.

At the 10-year follow-up the success rate had deteriorated to 33 per cent, and here the original age of the patient was an important factor, the success rate varying from 50 per cent in the 4th decade to nil in the 8th decade of life. The 5th decade had the best results, namely 42 per cent still excellent at the 10-year follow-up.

The possible causes of the failure of the arterial reconstruction in the 39 cases out of 64 which had been followed for 10 years are shown in Table II. The very

TABLE II
*Possible causes of the failure of the Arterial Reconstruction
in the 39 cases which had failed in 10 years*

Coronary Thrombosis	29 cases (74%)
Cerebral Thrombosis	2 cases
Unknown	8 cases
<i>Fall in blood pressure associated with the coronary thrombosis is probably the aetiological factor in graft failure</i>	

high incidence of coronary thrombosis, namely 74 per cent, indicated its supreme importance. It is very likely that the fall in blood pressure, associated with coronary thrombosis, is the aetiological factor in graft failure.

The 10-year life pattern after diagnosis of atherosclerosis of the lower limb is described in Table III, and this shows that 53 per cent of patients developed a coronary infarction during this period, and that 53 per cent of patients had

TABLE III
*10-year Life Pattern after diagnosis of lower limb atherosclerosis
by biopsy at operation*

<i>Age</i>	<i>Total</i>	<i>1st leg excellent 10 years</i>	<i>2nd leg Involved</i>	<i>Coronary Thrombosis</i>	<i>Alive</i>	<i>Dead</i>	<i>Cause of death</i>
30-40	4	2 (50%)	4 (100%)	2 (50%)	3	1 (25%)	1 C.T.
41-50	12	5 (42%)	5 (42%)	9 (75%)	8	4 (33%)	3 C.T. 1 Ca Lung
51-60	32	11 (34%)	17 (53%)	17 (53%)	20	12 (37%)	8 C.T. 3 C.V.A. 1 Miscellaneous
61-70	12	3 (25%)	4 (33%)	4 (33%)	9	3 (25%)	1 C.T. 1 Ca Lung 1 Miscellaneous
71-	4	0	4 (100%)	3 (75%)	1	3 (75%)	3 C.T.
	64	21 (33%)	34 (53%)	35 (53%)	41 (63%)	23 (37%)	16 C.T. 3 C.V.A. 2 Ca Lung 2 Miscellaneous

developed clinical signs of obliterative arterial disease in the second limb at this stage. In all 37 per cent of the cases were dead at 10 years, the commonest cause being coronary thrombosis. Naturally, the highest death rate occurred in the ealderly patients, there being little difference in the other decades except that it was surprising that the 6th decade showed a higher death rate than the 7th, due to the higher incidence of coronary thrombosis.

Factors which may influence the life pattern are shown in Table IV. While at 5 years there is little difference between hyper- and normotensive patients, at 10 years the hypertensive patient had a 50 per cent excellent result compared with 31 per cent of the normotensives. Again, surprisingly enough, the hypertensive sufferers had a 28 per cent mortality as opposed to 42 percent among normotensive patients. This is surprising in view of the Framingham Inquiry, but it may be that hypertension keeps the arterial reconstruction functioning for a longer period than in those patients with normal blood pressures. The percentage of patients who died from coronary thrombosis was about equal in both groups, and the increased death rate in the normotensive patient was due to the two cases of carcinoma of the lung and the two miscellaneous cases. If the electro-cardiograph was normal before operation the prognosis was better, and this was especially so in the 10-year follow-up, where 39 per cent of the cases were excellent as opposed to 25 per cent where a coronary thrombosis had occurred before operation. Similarly, there was a difference in the prognosis as regards mortality, and only 28 per cent of those patients with a normal electro-cardiograph were dead at 10

TABLE IV
Factors which may influence life pattern

<i>Age at onset</i>		<i>Poor prognosis in elderly</i>		
		<i>5 year excellent</i>	<i>10 year excellent</i>	
Hypertension	28 cases (40 %)	18 (64 %)	14 (50 %)	8 dead (28 %) 6 C.T. 2 C.V.A.
Normotensive	36 cases (56 %)	19 (53 %)	11 (31 %)	15 dead (42 %) 10 C.T. 1 C.V.A. 2 Ca Lung 2 Misc.
Pre-op. C.T.	28 cases (44 %)	12 (43 %)	7 (25 %)	13 dead (47 %) 8 C.T. 2 C.V.A. 2 Ca Lung 1 Misc.
Normal E.C.G. pre-op.	36 cases (56 %)	20 (55 %)	14 (39 %)	10 dead (28 %) 8 C.T. 1 C.V.A. 1 Miscellaneous
Normal E.C.G. pre-op. C.T. during follow up period	11 cases (16 %)	5 (45 %)	3 (27 %)	9 dead (82 %) 8 C.T. 1 C.V.A.
Involvement of second limb	16 cases (25 %)	7 (44 %)	5 (31 %)	8 dead (50 %) 6 C.T. 1 Ca Lung 1 C.V.A.

years as opposed to 47 per cent of those who had had a coronary thrombosis before operation. Of those patients who had a normal electro-cardiograph before operation, but developed a coronary thrombosis during the follow-up period, the prognosis was poor, but the figures are too small to be of importance, except the mortality, which shows an 82 per cent death rate if a coronary thrombosis occurs during the follow-up period in the patient who previous to operation had a normal electro-cardiograph. Involvement of the second limb also gives a poor prognosis from the point of view of the arterial reconstruction and mortality. Half of those who had involvement of the second limb were dead within ten years of the arterial reconstruction.

After 10 years, out of the original 64 cases, 21 still have an excellent functioning graft. These 21 cases consider that their life is normal, and those who are of working age are all doing their normal work. Of the 23 cases who died during the follow-up period, 16 deaths were caused by coronary thrombosis, 3 by cerebral vascular accidents, 2 by carcinoma of the lung, and there were 2 miscellaneous causes; i.e., 82 per cent of cases died from cardiac or cerebral disease, and this is close to Bloor's figure of 76 per cent. Coronary thrombosis, both pre-operatively and during the follow-up period, was the most important factor in the prognosis. Involvement of the second limb is also a poor prognostic sign. Atherosclerosis of the lower limb diminishes life expectation, and the average age of death of both males and females was 58.7 years, while the United Nations Statistics give 70.8 years as the normal life expectation.

SUMMARY

The ten-year life pattern of 64 cases of lower limb atherosclerosis following reconstructive arterial surgery is described. Spread of the disease to coronary arteries, second leg and cerebral arteries, indicates a poor prognosis both as regards the life of the patient and the function of the arterial reconstruction. Coronary artery involvement is the dominant factor in the prognosis. In most cases there was a relentless spread of the atherosclerosis but, in spite of this, 33 per cent were alive, with a functioning arterial reconstruction, ten years after operation.

REFERENCES

- BLOOR, K. (1961). *Ann. Roy. Coll. Surg.*, **28**, 36.
COCKETT, F. B., and MAURICE, B. A. (1963). *Brit. med. J.*, **1**, 353.
DARLING, R. C., and LINTON, R. R. (1964). *New Eng. J. Med.*, **270**, 609.
EADIE, D. G. A. (1970). *Brit. J. Hosp. Med.*, **5**, 18.
EASTCOTT, H. H. G. (1969). *Arterial Surgery*. Pitman Medical, London.
GILLESPIE, J. A. (1970). *Brit. J. Hosp. Med.*, **5**, 9.
GORDON, T., KANNEL, W. B., and SORLIE, P. (1972). *Framingham Study, 16 year follow-up*. National Heart and Lung Institute; National Institute of Health. Washington D.C.
JUERGENS, J. L., BARKER, N. W., and HINES, E. A. (1960). *Circulation*, **21**, 188.
WAHLBERG, F. (1962). *Acta med. Scand.*, **171**, 1.
WATT, J. K., GILLESPIE, G., POLLOCK, J. G., and REID, W. (1974). *Brit. med. J.*, **1**, 23.